REMARKS

Amendments to the Claims

Applicants have amended claims 20 and 21 to more particularly define the claimed invention. Support for these amendments is found, *e.g.*, on page 6, lines 8–21; page 13, lines 12–35; page 24, lines 14–27; page 28, line 25 to page 29, line 25; page 30, lines 5–8; Example 4, page 35, lines 3–22; and in SEQ ID NO:1 of the substitute Sequence Listing.

Applicants have amended claims 33, 35 and 40 to rewrite them in independent form and to more particularly define the claimed invention. Support for these amendments is found, *e.g.*, on page 6, lines 14–32; page 13, lines 12–35; page 28, line 25 to page 29, line 25; page 30, lines 5–8; and in SEQ ID NO:1 of the substitute Sequence Listing.

Applicants have further amended claim 35 by reciting "part (a)" immediately before "(ii)" and reciting "the" apoplast. Applicants have amended claim 38 by reciting "part (a)" immediately before "(i)." Support for the amendments is found, *e.g.*, in claim 35.

Applicants have added claim 47, drawn to a process for the production of linear α-1,4 glucans, fructose and/or fructose syrup. Support for added claim 47 is found, *e.g.*, on page 6, lines 14–32; page 13, lines 12–35; on page 24, lines 8–27; page 30, lines 5–8 of the specification as filed; and in SEQ ID NO: 1 of the substitute Sequence Listing.

None of the amendments adds new matter. Their entry is requested.

Applicants reserve the right to continue to prosecute and to obtain claims to the canceled subject matter either in this application or in another application claiming benefit herefrom.

Claim Objections

The Examiner has objected to claims 33, 35 and 40 for being dependent upon a non-elected claim. Applicants have obviated these objections by amending claims 33, 35 and 40 to be independent claims.

The Drawings

The Examiner has objected to the drawings under 37 C.F.R. §§ 1.84(b) and (m). Applicants enclose new drawings herewith, thus obviating the objections.

Rejections under 35 U.S.C. § 112, Second Paragraph

The Examiner has rejected claims 36–38 for allegedly failing to particularly point out and distinctly claim the subject matter which applicants regard as their invention. Specifically, the Examiner states that "an" preceding "apoplast" should be changed to "the" in claim 36. The Examiner states that, in claim 37, "a" preceding "apoplast" should be changed to "the" and "claim 35" should be inserted before "(ii)." The Examiner also states that, in claim 38, "claim 35" should be inserted before "(i)." Finally, the Examiner alleges that claim 38 is indefinite in the recitation "sucrose storage organs of the plant," because the applicants have not defined the term or pointed out which plants possess "sucrose storage organs."

Contrary to the Examiner's assertion, the recitation of "an apoplast" in claim 36 is not indefinite. The phrase "an apoplast" in claim 36 is the first recitation of an apoplast. Because there is no antecedent basis for apoplast, "an apoplast" is not indefinite.

Applicants have amended claim 37 to recite "the protoplast." Applicants have further amended claim 37 to recite "part (a)(ii)." It is clear that "part (a)(ii)" in claim 37 refers to that part of claim 35 because claim 37 depends from and incorporates the limitations of claim 35.

Applicants have amended claim 38 to recite "part (a)(i)." It is clear that "part (a)(i)" in claim 38 refers to that part of claim 35 because claim 38 depends from and incorporates the limitations of claim 35.

Contrary to the Examiner's assertion, "sucrose storage organs of the plant" in claim 38 is not indefinite. Sucrose storage organs are well-known in the art and are described in the specification. The specification states that, "organs of the plants that store large amounts of sucrose...are, *e.g.*, the root of the sugar beet or the stem of the sugar cane." See, page 16, lines 9–12 of the specification as filed. Thus, the term is not indefinite but has a meaning that is recognized in the art and that is described in the specification.

The Examiners also alleges that "the common storage compound in plants is starch." See, page 3, lines 14–15 of the instant Office Action. This is not correct. The type of storage compound depends on the plant species and the storage organ itself. For example, potato stores starch in tubers but soybean stores proteins in seeds, sugar cane stores sucrose in the stem, rape seed stores oil in the seeds, and sugar beet stores sucrose in the tap root. Because storage compounds in plants include compounds other than starch, applicants believe that the rejection should be withdrawn. Accordingly, applicants request that the Examiner withdraw the rejection of claim 38.

Based on the foregoing remarks and amendments, applicants request that the Examiner withdraw the outstanding rejections of claims 36, 37 and 38 under 35 U.S.C. § 112, second paragraph.

Rejections under 35 U.S.C. § 112, First Paragraph

(1) The Written Description Requirement

The Examiner has rejected claims 33–38 and 40–41 under 35 U.S.C. § 112, first paragraph, alleging that the specification lacks a detailed written description

of the invention. The Examiner acknowledges that applicants isolated a nucleic acid encoding an amylosucrase and expressed it to produce amylosucrase. However, the Examiner alleges that the application does not identify structural features unique to the *Neisseria polysaccharea* amylosucrase or functional domains of the protein. The Examiner contends that the written description of the invention requires a precise definition, which distinguishes the genus from other genera, and that a definition by function alone is insufficient to define a genus because it is only an indication of what the gene does, rather than what it is. Thus, the Examiner contends it is not clear what features identify such an amylosucrase protein or protein exhibiting amylosucrase activity "given the lack of an assay to identify proteins with a clear amylosucrase activity." See, page 5, lines 3–4 of the instant Office Action. Applicants traverse.

First, as acknowledged by the Examiner, the specification provides structural features unique to the *N. polysaccharea* amylosucrase, including its nucleic acid sequence (SEQ ID NO: 1) and amino acid sequence (SEQ ID NO: 2). As discussed above, applicants have amended claims 33, 35 and 40 to recite that the nucleic acid sequences have at least 60% sequence identity to these structurally defined nucleic acid molecules. Thus, the nucleic acid molecules are structurally defined. Applicants have also recited in claim 33 that the proteins encoded by the structurally defined nucleic acid molecules must have amylosucrase activity. As discussed below, applicants have provided assays to readily determine amylosucrase activity. Thus applicants have defined the nucleic acid both structurally and functionally and thus provide a sufficient written description of the claimed subject matter.

Second, the Examiner is incorrect in his statement regarding "the lack of an assay to identify proteins with a clear amylosucrase activity." The specification provides several descriptions of assays to detect an amylosucrase activity. For

example, page 9, lines 1–21 discloses methods of detecting amylosucrase activity. Further support for assays to identify amylosucrases is found, *e.g.*, in Example 3, page 33, line 6 to page 35, line 2 of the specification as filed. In particular, Example 3(c) teaches two alternative methods for identifying an amylosucrase activity: detecting amylosucrase activity on sucrose-containing agar plates (Example 3(c)(i)); or detecting an amylosucrase activity after separation of proteins by polyacrylamide gel electrophoresis (Example 3(c)(ii)).

Given that applicants identify the nucleic acid molecules used in the claimed methods both structurally and functionally and given that the applicants disclose several assays in which to identify a protein with amylosucrase activity, applicants request that the Examiner withdraw the written description rejection of claims 33–38 and 40–41 under 35 U.S.C. § 112, first paragraph.

(2) The Enablement Requirement

The Examiner has rejected claims 33–38 and 40–41 under 35 U.S.C. § 112, first paragraph, alleging that the invention lacks enablement.

First, the Examiner acknowledges that applicants disclose the isolation of a genomic sequence encoding a *N. polysaccharea* amylosucrase, which was cloned into a vector and transformed into *E. coli*. The Examiner further acknowledges that amylosucrase was detected in *Escherichia coli* and that soluble and insoluble products were detected in the growth medium, but alleges that applicants do not disclose the products' identity. The Examiner contends that the applicants have not reduced their invention to practice and have not demonstrated that α-1,4 glucans, fructose and/or fructose syrup can be produced and isolated from (a) a culture medium comprising bacteria expressing amylosucrase; (b) a plant transformed with an amylosucrase; or (c) a solution comprising an isolated amylosucrase enzyme including the sucrose substrate.

Contrary to the Examiner's allegations, applicants have demonstrated the production of α-1,4 glucans by (a) bacteria expressing amylosucrase and (b) a solution comprising an isolated amylosucrase enzyme and a sucrose substrate. In Examples 3–5 of the instant specification, for example, linear α-1,4 glucans are produced by *E. coli* cells transformed with a vector comprising a genomic DNA sequence encoding an extracellular *N. polysaccharea* amylosucrase. In Example 3, applicants demonstrate that the transformed cells secrete the amylosucrase into the culture media and "[t]he products of the reaction catalyzed by amylosucrase were detected by adding Lugol's solution to the culture supernatant, leading to blue staining," an indicator of the presence of α-1,4 glucans. See, page 33, line 21 to page 34, line 2 of the specification.

As exemplified in Example 4, linear α-1,4 glucans are also produced *in vitro* with partially purified amylosucrase. The concentrated amylosucrase sample was incubated with sucrose and incubated at 37°C to produce both soluble and insoluble polysaccharides. See, page 35, lines 21–22 of the specification as filed.

Further, although applicants have not provided a working example of a plant transformed with an amylosucrase that produced α-1,4 glucans, one is not required. As stated in MPEP § 2164.02, "[c]ompliance with the enablement requirement of 35 U.S.C. § 112, first paragraph does not turn on whether an example is disclosed. Applicants disclose methods of making transgenic plants comprising a DNA molecule encoding an amylosucrase and producing plants capable of synthesizing. See, *e.g.*, page 12, line 9–28; page 15, line 20; and page 18, line 12 to page 20, line 28. The method are disclosed in the specification in such a manner that one of ordinary skill in the art could make and use applicants' claimed invention. Moreover, as discussed further below, it would not require undue experimentation to practice the invention as claimed.

Contrary to the Examiner's allegation that applicants do not disclose the identity of the soluble and insoluble products recovered in Example 4, applicants demonstrate that the insoluble reaction products had a maximum absorption of 605 nm and the absorption maximum of amylose is ~614 nm, thus showing that the insoluble product is likely to be amylose. See page 36, lines 4–5 of the specification. Moreover, applicants identified the soluble products as short-chained polysaccharides, having a chain length of between approximately 5 and approximately 60 glucose units that did not appear to be branched. See page 36, lines 6–11 of the specification. Thus, applicants demonstrate that the reaction products synthesized by amylosucrase are consistent with them being linear α-1,4 glucans.

The Examiner further contends that using amylosucrase to produce α-1,4 glucans does not always produce the expected results and cites various references in alleged support of his position.

This is not the case. In fact, none of the references cited by the Examiner establish or support his contention that using amylosucrase to produce α-1,4 glucans does not always produce the expected results.

The Examiner states that Remaud-Simeon et al., "Studies on a Recombinant Amylosucrase," Carbohydrate bioengineering. Proc. Int. Conf. Elsinore, Denmark, *Prog. Biotechnol.* 10: 313–320, 1995 (hereafter "Remaud-Simeon"), teaches that concentrations of sucrose higher than 30 g/l inhibit analysis sucrose and that the enzyme is activated by glycogen, starch and maltooligosaccharides, as well as by sucrose. In fact, Remaud-Simeon states that a polymer produced in a reaction with a purified amylosucrase in the presence of sucrose (30 g/l) and traces of glycogen (0.1 g/l) was a glucopolysaccharide composed of α-1,4 linkages. See page 317, lines 1–7. Remaud-Simeon states that they could not detect α-1,6-branched linkages and estimated that there was less than 5% of α-1,6-branched linkages. See page 317, lines

1–7 of Remaud-Simeon. Further, the level of inhibition reported by Remaud-Simeon was at most two-fold even at concentrations of 200 g/l of sucrose. Thus, contrary to the Examiner's assertion, Remaud-Simeon bolster applicants' claimed invention because it shows that α-1,4 glucans are formed by amylosucrase in the presence of sucrose. Further, although Remaud-Simeon disclose that glycogen, starch and maltooligosaccharides have an "activating effect" on amylosucrase, this result is not relevant to the instant application. Rather, this result demonstrates only that amylosucrase can use different acceptors for addition of the α-1,4 glucans, not that amylose produces a different product from linear α-1,4 glucans from sucrose. The elongation of these acceptors by amylosucrase in the presence of sucrose results in linear α-1,4 glucans—the acceptor molecules coupled to α-1,4-linked glucose units.

That amylosucrase is activated by activators such as glycogen, starch and maltooligosaccharides, as the Examiner contends, is also not relevant to the instant application. Although Figure 4 of Remaud-Simeon shows that various carbohydrates have an activating effect on amylosucrase, it also demonstrates that an activator is not required to produce α-1,4 glucans from sucrose by amylosucrase as there is a significant production of α-1,4 glucans when no activator is present. Thus, contrary to the Examiner's assertion, Remaud-Simeon supports applicants' claims.

The Examiner states de Montalk et al., "Characterisation of the Activator Effect of Glycogen on Amylosucrase from *Neisseria Polysaccharea*," FEMS Microbiol. Letts. 186:103–108, 2000 (hereafter "de Montalk (2000a)") teaches that glycogen is an activator of amylosucrase and that this interaction is sucrose concentration dependent. However, contrary to the Examiner's assertions de Montalk (2000a) actually supports applicants' claim that amylosucrase produces α-1,4 glucans from sucrose or that α-1,4 glucans are the major product formed by contacting an amylosucrase with sucrose. See, *e.g.*, the abstract of de Montalk (2000a), wherein the

authors state that "[a]mylosucrase produces an [water] insoluble α-1,4-glucan from sucrose, releasing fructose." As discussed above, that glycogen can activate amylosucrase or that glycogen can act as an acceptor for amylosucrase activity is not contested, but is not relevant to the methods claimed herein.

The Examiner further alleges that de Montalk (2000a) teaches that amylosucrase has binding sites for other carbohydrates, not just sucrose. However, de Montalk (2000a) states that "the decrease of the initial reaction rate at high sucrose concentrations appears to result from the decrease of the activator effect of glycogen, due to competition between sucrose and glycogen, rather than from a real substrate inhibition." (see page 106, second column, lines 33–37). Thus, there is not an additional binding site for substrates other than sucrose, as alleged by the Examiner, but rather that amylosucrase has two separate binding sites for sucrose. Further, de Montalk (2000a) acknowledges that the hypothesis that one binding site may bind carbohydrates other than sucrose has not been confirmed. See, page 107, column 1, lines 51–53. Thus, given that de Montalk (2000a) again confirms that amylosucrase produces α-1,4 glucans for sucrose, de Montalk (2000a) supports the applicants' invention.

The Examiner further states that de Montalk et al., "Amylosucrase from *Neisseria polysaccharea*: novel catalytic properties," FEBS Letts., 471:219–223, 2000 (hereafter "de Montalk (2000b)") teaches that amylosucrase synthesizes a large diversity of products in the presence of sucrose as a sole substrate and that the enzyme is capable of several different reactions. Again de Montalk (2000b) supports applicants' claims that amylosucrase produces linear α-1,4 glucans. First, it is undisputed that amylosucrase produce α-1,4 glucans. As described on page 221, column 1, lines 25–30, "[t]he polymer synthesized from sucrose (100 mM) by electrophoretically pure amylosucrase was analyzed by ^{13C}NMR. Chemical shifts

were characteristic of exclusively α-1,4-linked glucosyl units ... Indeed, no signal corresponding to an α-1,6-linked glucosyl residue was observed." Second, the products maltose and maltotriose are linear α-1,4 glucans. Thus, under all conditions tested, the majority of the products made by amylosucrase were α-1,4 glucans. See, *e.g.,* Table 1, page 221 of de Montalk (2000b). For these reasons, the teaching of de Montalk (2000b) supports applicants' claims.

The Examiner also states that Albenne et al., "Maltooligosaccharide disproportionation reaction: an intrinsic property of amylosucrase from *Neisseria polysaccharea*," FEBS Letts. 327:67–70, 2002 (hereafter "Albenne") teaches that amylosucrases can catalyze reactions other than the cleavage of the alpha-1-beta-2 linkage of sucrose. However, Albenne describes only that incubating amylosucrase in the presence of linear α-1,4 glucans, not sucrose, results in the formation of linear maltooligosaccharides—still a linear α-1,4 glucan. See page 68, column 1, lines 58–61. Further, Albenne teaches that amylosucrase catalyses the formation of linear α-1,4 glucans from sucrose. As disclosed on page 67, lines 1–4, "[a]mylosucrases ... are enzymes known ... for the formation of an insoluble α-1,4-linked glucan." Thus, contrary to the Examiner's assertion, Albenne does not teach away from applicants' claimed invention, but rather supports applicants' claims.

For the reasons discussed above, none of the publications cited by the Examiner teaches away from producing linear α-1,4 glucans from sucrose by amylosucrase. In fact, all of them teach production of α-1,4 glucans from sucrose. Thus, contrary to the Examiner's assertions, it is not unpredictable to produce α-1,4 glucans from culture media or from transgenic plants. Because the claims of the instant application are drawn to methods of producing α-1,4 glucans by amylosucrase in the presence of sucrose, these publications support applicants' claims.

The Examiner also contends that applicants have not specified which plants or in which organs the α-1,4 glucans will be made. The Examiner contends that, because plants allegedly do not store sucrose, it is unclear how the α-1,4 glucans will be made. The Examiner acknowledges that sucrose is transported in the phloem but alleges that applicants have not disclosed a method of utilizing phloem sucrose in their invention. The Examiner also questions how a plant will react to an increase in α-1,4 glucans.

Applicants have addressed in part the Examiner's allegation that plants do not store sucrose but rather starch in connection with the rejection of claims 33–38 and 40–41 under 35 U.S.C. § 112, second paragraph, above. Further, it is well known that sucrose is a central metabolite of plants. See, Quick and Schaffer in Zamski and Schaffer, 1996, "Photoassimilate Distribution In Plants And Crops: Source–Sink Relationships", Chapter 6, Marcel Dekker Inc., New York, (hereafter "Quick and Schaffer") attached hereto at Exhibit E. As stated in line 1 of the Introduction, "[s]tarch and sucrose are the major end-products of photosynthesis." Further, "[t]he phenomenon of sugar accumulation in sinks [(*e.g.* storage organs)], is widespread, and some of the most important agronomic crops are those that accumulate large amounts of sugar, particularly sucrose." See page 125, lines 42–45 of Quick and Schaffer. Moreover, the instant specification teaches sucrose storage organs, *e.g.*, "the root of the sugar beet or the stem of the sugar cane." See page 16, lines 11–12 of the specification as filed. Thus, contrary to the Examiner's allegations, plants do store sucrose and thus the storage sucrose could be utilized in the claimed invention.

The Examiner's contention that it is not clear how a plant will react to an increase in α-1,4 glucan, is mere speculation. The Examiner has provided no evidence or scientific reasoning to support his contention.

The Examiner concludes that, given the unpredictability of using amylosucrase to produce only α-1,4 glucans from plant or a plant organ, the lack of guidance and examples of using amylosucrase to produce α-1,4 glucans in a medium comprising a transformed host cell or plant cell or a solution incubated with amylosucrase and not produce another product of amylosucrase catalysis, the state of the art that allegedly teaches amylosucrase can catalyze multiple different reactions and produce products other than glucans, the making or using the claimed invention would require undue experimentation.

Taken the above comments and arguments together, applicants submit that one of ordinary skill in the art making and using the instant invention would require no undue experimentation. As such, applicants request that the rejections of claims 33–38 and 40–41 under 35 U.S.C. § 112, first paragraph be withdrawn.

CONCLUSION

Applicants request that the Examiner consider the foregoing remarks and allow the pending claims to issue. If the Examiner believes that a telephonic interview would be helpful, he is invited to call the undersigned at any time.

Respectfully submitted,

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APPENDIX OF AMENDMENTS

IN THE CLAIMS

20. (Twice Amended) A method of producing linear α-1,4 glucans comprising using a protein having the enzymatic activity of an amylosucrase that is coded for by a DNA [sequence obtainable by a process comprising the following steps:

(a) preparing a genomic or a cDNA library;

(b) transforming a suitable host cell with the library constructed according to (a);

(c) subjecting the transformed cells to iodine vapor in the presence of sucrose;

(d) identifying the cells that are stained blue;

(e) isolating and cultivating the cells identified in step (d);

(f) isolating the genomic DNA insert or the cDNA insert from the transformed cell; and

(g) verifying that the protein encoded by the isolated genomic or cDNA molecule has amylosucrase activity] molecule comprising a first DNA sequence encoding said protein, wherein said first DNA sequence is more than 60% homologous to a second DNA sequence selected from the group consisting of:

(a) a DNA sequence coding for a protein having SEQ ID NO:2;

(b) the coding region of SEQ ID NO:1;

(c) a DNA sequence encoding a protein having amylosucrase activity in the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number Deutsche Sammlung von Mikroorganismen (DSM) 9196;

(d) a DNA sequence coding for a protein encoded by the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(e) a part of any one of the DNA sequences of (a)–(d) coding for a protein having the enzymatic activity of an amylosucrase; and

(f) a full length complement of the DNA sequence of any one of (a)–(e);

incubating said protein encoded by said first DNA sequence with sucrose under conditions that allow said protein to produce linear α-1,4 glucans; and

isolating the linear α-1,4 glucans.

21. (Twice Amended) A method of producing fructose comprising using a protein having the enzymatic activity of an amylosucrase that is coded for by a DNA [sequence obtainable by a process comprising the following steps:

(a) preparing a genomic or a cDNA library;

(b) transforming a suitable host cell with the library constructed according to (a);

(c) subjecting the transformed cells to iodine vapor in the presence of sucrose;

(d) identifying the cells that are stained blue;

(e) isolating and cultivating the cells identified in step (d);

(f) isolating the genomic DNA insert or the cDNA insert from the transformed cell; and

(g) verifying that the protein encoded by the isolated genomic or cDNA molecule has amylosucrase activity] molecule comprising a first DNA sequence encoding said protein, wherein said first DNA sequence is more than 60% homologous to a second DNA sequence selected from the group consisting of:

(i) a DNA sequence coding for a protein having SEQ ID NO:2;

(ii) the coding region of SEQ ID NO:1;

(iii) a DNA sequence encoding a protein having amylosucrase activity in the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(iv) a DNA sequence coding for a protein encoded by the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(v) a part of any one of the DNA sequences of (i)–(iv) coding for a protein having the enzymatic activity of an amylosucrase; and

(vi) a full length complement of the DNA sequence of any one of (i)–(v);

incubating said protein encoded by said first DNA sequence with sucrose under conditions that allow said protein to produce fructose; and

isolating the fructose.

33. (Amended) A process for the production of linear α-1,4 glucans, fructose and/or fructose syrup comprising the steps of:

(a) culturing [the host cell according to claim 24 or the microorganism according to claim 27] a host cell comprising a protein having the enzymatic activity of an amylosucrase, that is encoded for by a DNA molecule comprising a first DNA sequence encoding said protein, wherein said first DNA sequence is more than 60% homologous to a second DNA sequence selected from the group consisting of:

(i) a DNA sequence coding for a protein having SEQ ID NO:2;

(ii) the coding region of SEQ ID NO:1;

(iii) a DNA sequence encoding a protein having amylosucrase activity in the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(iv) a DNA sequence coding for a protein encoded by the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(v) a part of any one of the DNA sequences of (i)–(iv) coding for a protein having the enzymatic activity of an amylosucrase; and

(vi) a full length complement of the DNA sequence of any one of (i)–(v);

wherein the host cell [or the microorganism] secretes [the amylosucrase] said protein encoded by said first DNA sequence into a culture medium comprising sucrose under conditions allowing expression and secretion of [the amylosucrase] said protein; and

(b) recovering the produced α-1,4 glucans and/or fructose from the culture medium.

35. (Amended) A process for the production of linear α-1,4 glucans comprising the steps of:

(a) producing an expression cassette comprising the following DNA sequences:

(i) a promoter that is active in plants and ensures formation of an RNA in the respective target tissue or target cells;

(ii) [the DNA molecule according to claim 2] a DNA molecule comprising a first DNA sequence encoding a protein having the enzymatic activity of an amylosucrase, wherein said first DNA sequence is more than 60% homologous to a second DNA sequence selected from the group consisting of:

(1) a DNA sequence coding for a protein having SEQ ID NO:2;

(2) the coding region of SEQ ID NO:1;

(3) a DNA sequence encoding a protein having amylosucrase activity in the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(4) a DNA sequence coding for a protein encoded by the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(5) a part of any one of the DNA sequences of (1)–(4) coding for a protein having the enzymatic activity of an amylosucrase; and

(6) a full length complement of the DNA sequence of any one of (1)–(5); [which]

wherein said DNA molecule is fused to the promoter in sense orientation; and

(iii) a signal sequence functional in plants for transcription termination and polyadenylation of an RNA molecule fused to said DNA molecule;

(b) transferring the expression cassette into a plant cell;

(c) regenerating a transgenic plant from the transformed plant cell; and

(d) isolating the linear α-1,4 glucans synthesized in the plant from the plant.

37. (Amended) The process according to claim 35, wherein the DNA [sequence as indicated in] molecule of part (a)(ii) which codes for a protein having the enzymatic activity of an amylosucrase does not contain a signal sequence effecting secretion to [a] the apoplast.

38. (Amended) The process according to claim 35, wherein the promoter defined in part (a)(i) ensures the expression of amylosucrase in sucrose storage organs of the plant.

40. (Amended) A process for the production of linear α-1,4 glucans, fructose and/or fructose syrup in vitro comprising the steps of:

(a) contacting a solution comprising sucrose with a protein [according to claim 8] having the enzymatic activity of an amylosucrase encoded for by a DNA molecule comprising a first DNA sequence encoding said protein, wherein said first DNA sequence is more than 60% homologous to a second DNA sequence selected from the group consisting of:

(i) a DNA sequence coding for a protein having SEQ ID NO:2;

(ii) the coding region of SEQ ID NO:1;

(iii) a DNA sequence encoding a protein having amylosucrase activity in the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(iv) a DNA sequence coding for a protein encoded by the DNA insert of plasmid pNB2 from Neisseria bacteria having deposit number DSM 9196;

(v) a part of any one of the DNA sequences of (i)–(iv) coding for a protein having the enzymatic activity of an amylosucrase; and

(vi) a full length complement of the DNA sequence of any one of (i)–(v);

under conditions allowing the conversion of sucrose to α-1,4 glucans and fructose by [the amylosucrase] said protein encoded by said first DNA sequence; and

(b) recovering the produced α-1,4 glucans and/or fructose from the solution.